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RED JUNGLEFOWL AND KALIJ PHEASANTS

By

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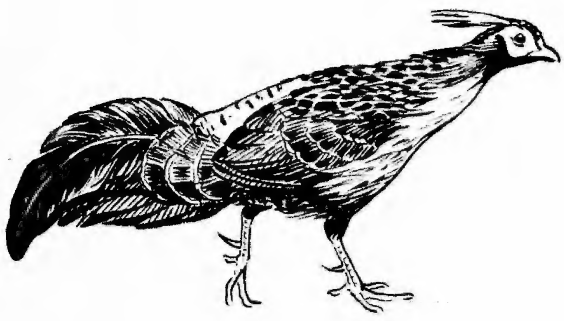

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THE FOREIGN GAME INTRODUCTION PROGRAM

Year by year the number of individuals seeking relaxation through hunting is increasing. Yet the area available for this sport is slowly decreasing. Likewise, much of the habitat which mothers the game crop is becoming less and less able to produce shootable surpluses under the impact of clean farming, over-grazing, drainage, power equipment, increased use of insecticides and herbicides, scientific forestry, urbanization, and declining soil fertility.

Faced with this situation, common sense dictates an all-out effort to increase habitat productivity. But there are many habitats which have been so thoroughly changed by man that native game species can no longer maintain themselves therein in numbers sufficient to provide good hunting. Competing interests and the cost of reversing this trend are such that only a part of these lands can be restored to reasonable productivity in the foreseeable future. There are other coverts which never were fully occupied by native game birds or mammals possessing the characteristics requisite to survival in the face of today's intensive hunting pressure. For these, new, adaptable species possessing a high hunting resistance should be sought, so that such areas might provide greater hunting opportunities. This is the logic behind the foreign game introduction program as developed cooperatively by the U.S. Fish and Wildlife Service, cooperating State Fish and Game Commissions, and the Wildlife Management Institute.

The program is based on requests for assistance from State Fish and Game Commissions following an ecological appraisal of their game-deficient habitats. After such information is in hand, biologists are assigned to make a careful study of game species occupying similar habitats and climates in foreign countries. From dozens considered, one or two may be selected on the basis of their characteristics, habits, reproductive capacity, resistance to predation and disease, relationship to agriculture, ability to withstand heavy hunting pressure, and the possibility of competition with game species native to the United States. Modest, carefully planned trial introductions of these species, utilizing wild-trapped individuals, carefully quarantined before shipment are then carried out in cooperation with interested State Fish and Game Commissions. Unplanned or "hit and miss" introductions are actively discouraged.

FOREWORD

Ever since the Foreign Game Introduction Program was started, in 1949, cooperating States have expressed continuing interest in finding a game bird that might thrive in woodland and forest habitats, where grouse, turkey, or quail are not found in sufficient numbers to provide satisfactory hunting opportunities. Attention has been directed recently to the possibilities of the Reeves pheasant for northern forested areas but, up to now, no bird has been recommended as potentially adaptable to the warmer woodlands lying for the most part south of the Mason-Dixon line.

While working in southern Asia, Foreign Game Introduction Program biologists have been alert to the possibilities of locating such a game bird. One excellent possibility, the copper pheasant of Japan, was rejected because of the difficulties of wild-trapping it in large numbers or of propagating it in captivity.

Monal, cheer, and koklass pheasants from the higher Himalayas have not been studied because of travel restrictions but may, likewise, be difficult to obtain in numbers. The forest-living, hill partridges and the red spurfowl from lower elevations were considered similarly and turned down. Their secretive habits and reluctance to take wing, unless hard-pressed, left much to be desired as a game bird. Only two species resident in India, the red junglefowl and the kalij pheasant, currently appear to be worthy of serious consideration. Both are excellent sporting birds, abundant over a large range, and occupy habitats similar to many forested areas in the southern United States. They are available in fair numbers apparently and are adaptable to propagation on game farms in numbers sufficient to permit substantial trial releases.

Though the ranges of the two overlap along the foothills of the Himalayas, the red junglefowl inhabits less rugged to flat forest and brushy coverts, where summers are hot and humid, and mild winter temperatures prevail. The kalij inhabits rougher or more mountainous, wooded terrain, with cooler summers and somewhat colder winters.

This report supplements the Game Bird Data Sheets, previously prepared, covering these species. It is based on a comprehensive review of the literature and on field observations, unavoidably restricted by Indian security regulations. Emphasis is placed on salient points in the consideration of a species for trial introduction and on the general areas in various States in which either or both might well be worth a trial.

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JUNGLEFOWL IN GENERAL

Southern Asia is the home of many remarkable game birds. Among the larger species, the most abundant and widely distributed is the junglefowl. Of adaptable habits, wary, and agile of wing, this denizen of forest, scrub, and adjacent croplands has maintained its numbers for centuries with remarkable tenacity against the combined inroads of guns, nets, snares, and egg-collecting villagers.

The junglefowl, progenitors of the domestic chicken, are members of the genus Gallus in the pheasant family. Four distinct species have been recognized, of which the gray junglefowl, Gallus sonneratii, whose neck hackles exite the interest of fly tiers, is limited to southern India. The more spectacularly colored red junglefowl (Gallus gallus) representing five subspecies ranges over 3,900 miles from northwestern India eastward through Assam, Burma, Thailand, and Malaya to Indo-China, the extreme south of China, Hainan, Sumatra, and Java.

All the junglefowls are woodland birds, some preferring heavily forested areas with dense clumps of undergrowth, others more open scrub and second-growth. Like the ruffed grouse, however, they are most abundant where there is some interspersion of dense growth with moderately open, brushy areas, roads, trails, eroded patches or fields. Moderate to fairly heavily grazed woodlands are utilized provided food and cover are present.

Climates vary from fairly dry in central India to hot and humid in southeastern Asia. Most of the subspecies occur where winters are warm, though the Indian red junglefowl, (murghii), along the lower flanks of the Himalayas, is no stranger to snow or to temperatures somewhat below freezing.

Topographically, the Indian junglefowl is found commonly on rough, hill, or mountainous terrain. Flat lands also are not avoided, although, in India, most of these have been cleared for cultivation in recent years.

In the United States there is much habitat, particularly east of the Mississippi, in parts of western Washington, Oregon, and California, and in Hawaii, which is rather similar to the native coverts occupied by junglefowl in India. In eastern United States, winter temperatures and snow might limit successful introductions to the south of an irregular line drawn from northeastern Texas through central Arkansas, western Tennessee, northern Georgia and South Carolina, eastern North Carolina, and extreme southeastern Virginia. (See Fig. 1).

Taxonomy and Distribution

Delacour (6), who published the most recent reclassification of genus Gallus, lists the junglefowls as follows:

	Order	Galliformes
	Family	Phasianidae
	Genus	Gallus
Species		
Gray junglefowl	G. sonneratii	Southern India
Ceylon junglefowl	G. Lafayettii	Ceylon
Green junglefowl	G. varius	Java, Bali, Lombok, Flores, Alor, Sumbawa, and Sumba
Indian red junglefowl	G. gallus murghii	Northern, central, eastern India and western Burma
Burmese red junglefowl	G. g. spadica	Burma, Thailand, northern Laos, Malaya and northern Sumatra
Tonkinese red junglefowl	G. g. jabouilli	Extreme southern China
Cochin-Chinese red junglefowl	G. g. gallus	Cochin China, Cambodia, Annam, Laos
Javan red junglefowl	G. g. bankiva	Southern Sumatra, Java, and Bali

Domestication and Introductions

No bird has contributed more to the welfare of the human race than has the junglefowl. Probably bred in captivity in southern and southeastern Asia before historic times, domestic fowls, descendents of the red junglefowl, were known in the Indus Valley about 2500 B.C. and in southeastern Asia before 1400 B.C. By 1500 B.C., Beebe (4) indicates that fowls had spread to central and northwestern Europe and subsequently to many other lands for use as food, fighting cocks, emblems, and as a religious symbol.

It is likewise the red junglefowl that has been successfully acclimatized as a wild bird in several parts of the world. They were earlier introduced into the Phillippines and to many other islands in the western Pacific. These birds probably reverted to the wild from semi-domestic fowl which accompanied the movement of men from island to island. Red junglefowl were liberated in Natal, South Africa, in the present century and are now well established.

Regarding attempts to acclimatize this bird, Delacour (6,p.108) who has studied it both in forest and aviary, says, "The Red Junglefowl is a first-class game bird, wary, cunning and strong, and its flesh is excellent for the table. In our opinion, they have not been sufficiently tried in Europe or America for that purpose. Their resemblance to ordinary poultry is probably the cause of such a regrettable neglect, as in many districts they would be far preferable to the ordinary Pheasants."

THE RED JUNGLEFOWL OF INDIA

This report is primarily concerned with the red junglefowl of India (G. g. murghii). This race was selected because of its wide distribution and its ability to thrive under greater extremes of temperature and precipitation than characterize the range of the other subspecies. Considered also was the relative ease with which breeding stock can be secured in India for game farm propagation and trial introduction.

Common Names

In southern Asia common names of birds vary radically with district and dialect. Those most frequently used in India and Burma for the red junglefowl include the following:

Red junglefowl	General
Jungli moorghi	Hindi, India and Nepal
Bun moorghi	Hindi, northern India
Bunkokra, bun-kookoor	Bengali, southeastern India
Natsu-pea	Bhutea, Bhutan
Pazok-tehi	Lepcha (Assam)
Beer-seem	Koles
Gera-gogor	Gonds
Lall	Chanda Dist., India
Tanquet, Tanghet	Burmese, Burma

Distribution and Relative Abundance

The range of the Indian red junglefowl extends for 1,400 miles from the Indus River in West Pakistan southeastward along the foothills of the Himalayas and adjacent lowland forest and scrub areas to south central Nepal, Sikkim, Bhutan, Assam, and western Burma, south through central and eastern India to the Bay of Bengal. The

plains of the Ganges are too heavily cultivated to provide junglefowl habitat, but to the south, east of a line through Jhansi and Nagpur, to the Godavari River and along it to the Bay, red junglefowl are usually to be found wherever terrain is rough or there are forests. Along the lower flanks of the Himalayas, from 1,200 to 6,000 feet, the range of the junglefowl overlaps that of the kalij pheasant so that either or both may be flushed from the same covert.

No reliable records of abundance have been maintained. In some areas, 15 birds may be flushed in a day's hunt; in others 200 or more may be driven over a line of hunters by 15 to 20 beaters in the same period. In India, the species is not considered to be cyclic though fairly substantial variations in abundance have been noted from year to year. In the Siwalik foothills and adjacent lowlands, south of Dehra Dun an estimate of 1 bird per 5 to 10 acres for the winters of 1959-61 might be conservative.

Description

In its breeding plumage the male red junglefowl is a striking bird, with white ear lobes, long orange and black mantle, orange and red rump feathers with a tuft of white at the base of the tail, blackish, sickle-shaped, inner tail feathers glossed with almost metallic green, and blackish-brown breast. Stuart Baker (3) has described these birds in detail as follows:

"Male

"Crown of head, nape, upper mantole and sides of neck deep bright orange-red changing to reddish-black down their centres; upper back black glossed with blue or green; lower back deep maroon-red, highly glossed and gradually changing into fiery-orange on the long hackles of the rump, the centres of these hackles black but concealed by those overlying them; upper tail-coverts and tail black, brilliantly glossed with green, blue-green or copper-green, the blue generally dominant on the coverts and all gloss absent or obsolete on the outermost tail-feathers; least wing-coverts and shoulder of wing black glossed like the back; median wing-coverts like the lower back; greater coverts black; quills dark brown or blackish, the primaries edged on the outer web with light cinnamon, outer secondaries with much broader edges and the innermost glossy blue-green; under plumage blackish-brown faintly glossed with green.

"Iris reddish-brown, red, or orange-red; comb brick-red to scarlet-crimson; wattles a rather more livid red; lappets white, sometimes

touched with pink; skin of head bluish or fleshy-red; bill dark horny-brown, the base and gonys reddish; legs and feet greenish-gray to deep slaty-brown equipped with long, often curved, very sharp spurs.

"Female

"Top of the head blackish-brown, the feathers broadly edged with golden-yellow; in most birds the forehead is more or less metallic crimson, this sheen being produced back as supercilia to behind the ear-coverts, where they widen and meet on the foreneck as a broad gorget; feathers of nape orange-yellow with broad blackish centres, changing to pale golden-yellow on the longer hackles; upper plumage, wing-coverts and inner secondaries reddish-buff or reddish-brown with pale shafts and dark brown vermiculations; primaries dark brown edged with rufous; tail dark brown, mottled with dull rufous, absent on the outer pairs; breast dull Indian red with pale shaft-lines shading to dull cinnamon on the abdomen, much vermiculated with brown; under tail-coverts black or blackish-brown.

"Iris brown; comb and small wattles, sometimes absent, dull crimson; bill horny-brown, base and gape plumbeous-fleshy. The legs and feet are greenish-gray to deep slaty-brown usually with no, or at best rudimentary spurs."

Crossbreeds

In India, crosses between village poultry and wild red junglefowl are not always easy to recognize. Halfbreeds that otherwise resemble wild birds may often be identified by the absence of white ear lobes, of the white tuft at the base of the tail, legs that show a touch of yellow and by the erect rather than nearly horizontal carriage of the sickle-shaped tail.

Size and Weight

Wild red junglefowl males resemble well-conditioned fighting cocks in size and weight. Hume (8) gives the length of the male as 25.0 to 28.2 inches; the female as 16.5 to 18.25 inches. Adult males will weigh from 1.5 to 2.0 pounds; females are slightly smaller. As with the ring-necked pheasants, after several generations in captivity, these birds tend to become heavier.

Habitat and Cover Preferences

The Indian red junglefowl prefers flat and rolling, or, more rarely, steep country, from sea level up to 6,000 feet. In northern India, optimum conditions are found in winter from 1,000 feet to 3,000 feet and during the hot months from 2,000 to 4,000 feet. Included within its range are both acid and alkaline soils. Alluvium, clay loams, sandy loams, red soils and brown forest soils comprise the main soil groups.

Indian junglefowl, like ruffed grouse, are primarily forest and scrub-loving species, particularly in the vicinity of scattered cultivated or overgrown fields along and out from the lower hill slopes where some water is available throughout the year. They like edge cover, from which they move out into fields, though seldom for any great distance. Forested or brushy areas several miles from cultivation also are frequented provided there is some thick undergrowth interspersed with more open woodlands.

The forest types vary from fairly mature second-growth and spot-lumbered, all-aged forests, common in the Himalayan foothills, to the much more open, mixed hardwoods and tropical thorn forests and jungle of the dryer alluvial plains. Hardwoods, some of which maintain their leaves throughout the year, predominate, though junglefowl are also found in fair numbers when there is an admixture with pine. Sal (Shorea robusta), a tall tree with large leaves, is characteristic of many junglefowl habitats, though usually in association with many other hardwoods. Teak and bamboo forests also are frequented. Undergrowth may be fairly dense or, if open, must include a considerable number of thicker clumps such as is provided by bamboo and lantana. Leaves, small shrubs and herbs and grass, often in clumps, usually form a rather open ground cover.

Junglefowl prefer small clearings in brushy situations for feeding and are great leaf scratchers in their search for food. Cultivated fields of grain, rice, mustard, cotton or chili adjoining forests or scrub growth are attractive. They also feed along dirt roads passing through forest or scrub areas wherever available.

In the Siwalik Range, north of New Delhi, junglefowl are found in thick to fairly open scrub jungle ravines as well as in extensive deciduous forest slopes and flats. South of this range they are abundant on flat to locally rough terrain, bisected by often dry stream beds. Temperate type forests here gradually become mixed with dry thorn jungle which, if fairly dense, still harbors many birds.

Figure 1 -- Red junglefowl are often found in fairly open country with some wooded areas and patches of dense brush.

Figure 2 -- Second-growth woodlands with edges are to their liking.

Figure 3 -- Junglefowl also frequent fairly dense cover with considerable undergrowth.

Figure 4 -- A typical nesting situation for junglefowl.

In central India the birds often occupy sal and adjacent teak-bamboo forests. In Nepal, the junglefowl often is found in scrub at the forest edge, particularly the prickly "jherberi" (Zizyphus) bushes and to bamboo groves and mixed deciduous forests in stony foothill country broken by shallow valleys. In Assam, a mixture of evergreen and deciduous forests, often long distances from hill country, are utilized. It seems to avoid pure coniferous forests and wet or boggy ground.

Climatic Comparisons

The climate prevailing in the range of the red junglefowl in India finds its counterpart mainly in deep South from eastern Texas to Florida and north to eastern South Carolina. Even then it is only approximately analogous because, in India, there are heavy summer and light winter monsoons with dry periods between. Likewise, temperatures in all but the hilly, colder parts of the range are usually higher in winter than are those in many parts of the southern United States. On the other hand, wild junglefowl will stand short periods in which night temperatures fall to 20°F. or below and in captivity, have survived down to zero.

Junglefowl are common in India where the rainfall occurs principally from June through September, sometimes in the form of torrential downpours. From October to May, forest areas become increasingly dry, though light rains usually offer some relief from December through March. At the higher elevations and in Assam, precipitation is higher and better distributed throughout the year except for a dry period in the fall. Average annual rainfall in junglefowl country varies from 40 inches on the plains to 129 inches in Assam. There is heavy dew during the dry periods. Snow is unusual and of short duration.

Warm to hot, humid summers and mild winters appear well-suited for junglefowl. Spring and fall are hot and dry with temperatures from 90°to 100°F. not uncommon. Summers are cooler and wet with daytime temperatures ranging between 80°and 95°F.; average minimums seldom fall below 45°F., although frosts at night are not uncommon. Some junglefowl winter up to 3,000 feet, where it is somewhat colder, but winter temperatures over most of the range seldom go below freezing.

Climacurvic comparisons of junglefowl range with climatically similar areas in the United States are not presented here because of the paucity of weather records from the Himalayan foothill country in many parts of which the species is common. In their place is presented a map (Fig. 1) indicating the areas in southeastern United States within which the climate might be suitable for trial introductions.

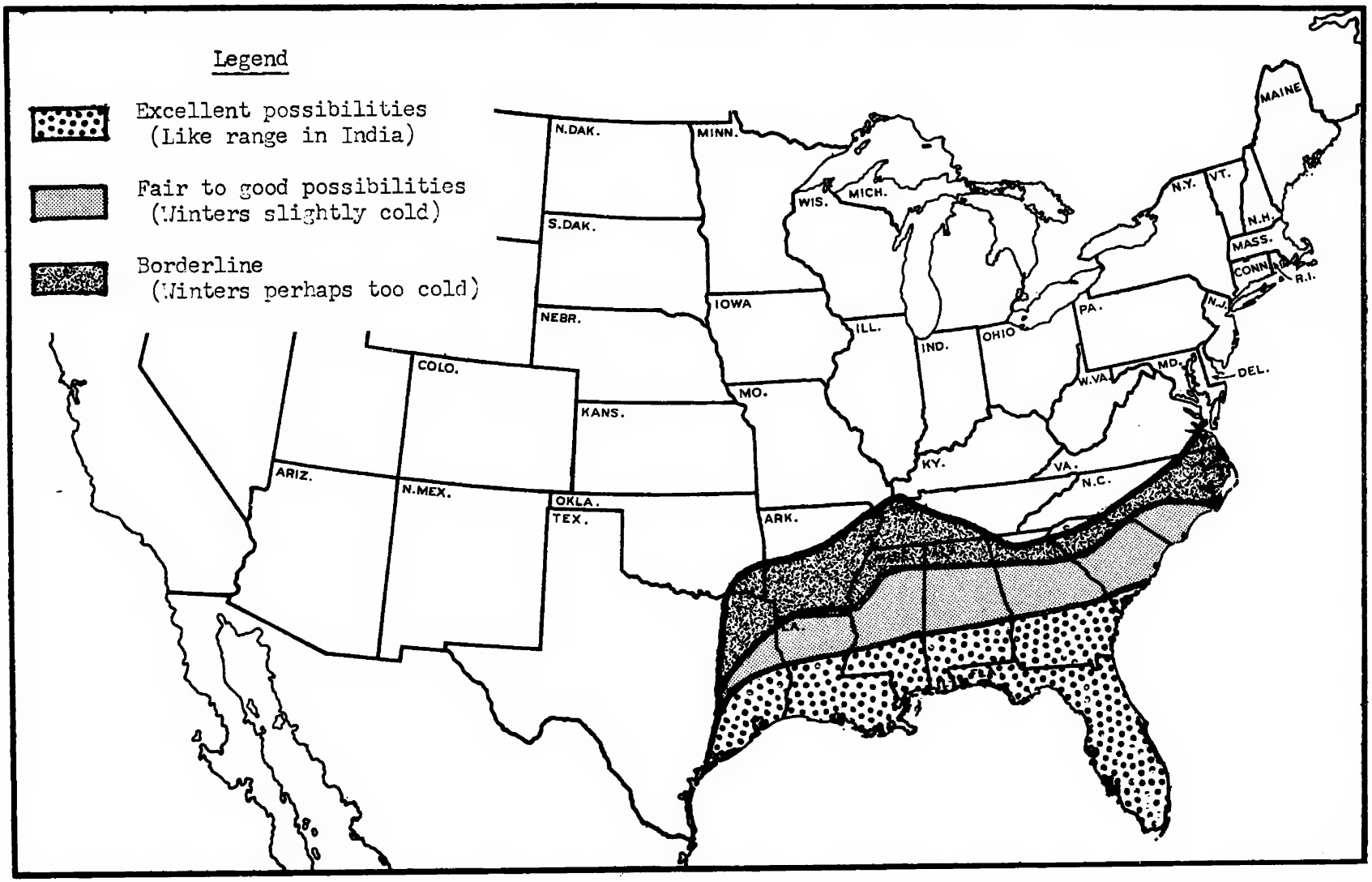

Figure 5 -- Areas in the Southern United States with climate rather similar to red junglefowl range in India.

Food and Water

An omnivorous feeder, the junglefowl takes a wide variety of plant and animal foods. Grain, grass, wild shrub and tree seeds, berries, fruits, leaves, shoots and roots as well as ants, flies, beetles, spiders, small snails, earthworms and lizards are eaten. Vegetable matter by volume represents about 90 percent; animal matter, 2 to 3 percent; and miscellaneous grit and trash, 7 to 8 percent of the normal crop contents. The bird is also a scavenger and occasionally fills its crop with dung in the manner of domestic poultry.

Birds often feed in family parties of a cock and three to four hens, early and late, in stubble or wild mustard fields adjacent to wooded areas, along roads and firelines or in forest clearings. Often while hunting one hears them scratching about among the leaves, and thoroughly dug-up patches of the forest floor are a common sight where junglefowl are abundant. Though mostly ground feeders, they do not hesitate to perch on any branch that will bear their weight in search of wild fruits, including those of the pipal and banyan trees. The seeds of bamboo also are attractive.

No detailed food-habits study of this species is available, so under the FGI Program, 37 crops, mostly from the six months' hunting season, have been collected and examined. Some 30 different kinds of seeds and many insects have been found but less than half have been identified. The following is a list of those recognized to date, together with the number of crops from which they were identified:

Plants	Number crops
Trichosanthes cucumerina	6
Rubus sp.	5
Carissa opaca	4
Zizyphus jujuba	4
Shorea robusta	3
Digitaria sp.	3
Stellaria media	2
Oryza sativa (rice)	2
Grass (*Panicum* and others)	2
Roots	2
Oxalis corniculata	1
Adiantum caudatum	1
Rungia parviflora	1
Solanum sp.	1
sedge tubers	1

Animals	Number crops
Hymenoptera (ants)	7
Diptera (leaf miner)	3
Coleoptera (beetles)	6
Pulmonata (snails)	4
Isoptera (termites)	4
Hemiptera (bugs)	3
Diptera (flies)	2
Lepidoptera (moth pupae)	2
Aranae (spiders)	2
Orthoptera (cricket)	1
Diplopoda (millipede)	1
Miscellaneous	
Grit	8
Clay	1
Sand	1
Feces	2

Where dew is heavy, and succulent green food is to be found, these birds can go for long periods without recourse to other water sources but are inclined to prefer coverts where open water is available.

Inquiry in the field and a search of the literature have uncovered no instance where the red junglefowl has seriously damaged standing crops or cultivated fruits. Although various authors note that rice, millet, mustard and wheat are preferred foods, cultivated grains were, surprisingly, found in but two of the 37 crops examined to date, though some birds were shot in or at field edges. Corn, also, is eaten where the fields adjoin funglefowl coverts, but most of the grains taken seem to be picked up from the ground following the harvest.

General Habits

Movements and Mobility

Like most pheasants, junglefowl are nonmigratory and seldom move far from their home coverts. Nor is there much shifting of populations in winter, except when birds at higher elevations are forced into lowlands to avoid deep snow.

No pronounced daily movement pattern has been observed. Some birds seem to prefer early mornings and late afternoons for excursions into open fields and cultivated areas; others scratch about on the forest floor in small parties. Edge cover or clumps of undergrowth within the forest are used as resting sites.

These birds are good walkers. Unless surprised or hard pressed, many scuttle through the undergrowth by foot rather than fly to avoid danger. On the wing they are fast, direct fliers though seldom going over 300 to 500 feet from the point of flush before landing and continuing their way on foot. Many birds, once flushed take refuge in the branches of trees with such skill at concealment as to be difficult to locate again.

Wariness

Among many who have never hunted junglefowl there exists an impression that, since these birds are the progenitors of domestic poultry, junglefowl must be rather tame even in the wild. Nothing could be further from the truth. Though relatively unconcerned by the wanderings of man about their domain, once they sense the element of pursuit they are as wary and cunning as the best of American game birds.

Alerted by the crack of a twig or the shuffling of leaves underfoot, they walk away from the sound, seldom "Freezing" as grouse may in the hope of remaining undetected. Frightened, they either take to wing or run with surprising rapidity often keeping to the more open cover for they are not by nature good skulkers.

Resting and Roosting

Junglefowl normally roost from 20 to 50 feet up in hardwoods. They may form a close group along a limb or be scattered over different parts of the same or adjacent trees at night. The same roosting site may be utilized for long periods of time unless the birds are disturbed. Resting is likely to be on the ground either in or close to fairly thick clumps of undergrowth from which there are easy avenues of escape if needed.

Nesting and Renesting

Nests may be well hidden in a brushy clump, often in overgrown openings in the forest, in edge cover, or in open sites at the base of a tree or log, usually in second-growth woodlands. A slight hollow, lined rather haphazardly with grass and leaves, suffices. Renesting is the rule when the eggs have been destroyed before hatching. Usually only one brood a year is produced.

Nesting dates vary with region and elevation from March to September though, in India, eggs have been found from January to October. Along the base of the Himalayan foothills north of Delhi April through May are the preferred months, with most of the nests hatching between May 15 and June 15.

Eggs

The normal clutch for the first nest is 5 to 7 with renests usually 3 to 4. In shape, they resemble bantam eggs; in color, they are usually spotless and just off-white. Stuart Baker (3) found the measurement of 150 eggs to 45.3 X 34.4 mm.

No exact record of the incubation period has been reported. Delacour (6) indicates 19 to 21 days as the period for Cochin-Chinese red junglefowl.

Brooding and Rearing

Mother and young desert the nest soon after the last chick is dry and usually are not in company with the male, though occasionally one encounters male, female, and chicks feeding together.

Figure 6 -- An Indian game warden gathers a clutch of seven eggs from a nest well-hidden in the grass.

Figure 7 -- Junglefowl can be easily propagated in captivity.

Gregariousness

Though solitary birds, mostly males, occasionally are encountered, for the most part, junglefowl travel, feed and roost in pairs or in harem parties of one male and 2 to 4 hens, especially during the breeding season. Broods often stay together well into the fall. Where birds are abundant it is not unusual to flush 5 to 10 or occasionally more birds of both sexes out of a small area of edge or brushy cover.

Psychology and Behavior

The red junglefowl is an astonishingly agile and often shy bird but with a great capacity for relaxation when not unduly disturbed. First generation birds, raised in captivity, are more alert, move faster and are not as tame as are hand-reared ring-necked pheasants. Adults are seldom tamed except when bred over a period of years in captivity. When frightened, they bound into the air with a tremendous show of vitality. Even hand-raised birds when confined to a box or small cage seek escape so vigorously that heads are usually bloodied and often scalped in the first few minutes in captivity.

Males, during the breeding season, are likely to be quarrelsome and fight together, occasionally to the death. While pugnacious at other times of the year, once the question of the peck order has been settled, flocks containing several males and females are not uncommon.

In captivity in India, no difficulty was encountered in keeping junglefowl, a kalij pheasant, francolin, a chukar, and seesee partridges together in one pen during the fall and winter months. With the advent of the breeding season, however, the kalij pheasant was killed and the smaller species sometimes vigorously chased about the pen for short periods by the male junglefowl.

Calls

The call of the cock is a shrill, sharp crow, reminiscent of domestic fowls but much more abrupt, usually accompanied by a vigorous flapping of the wings while the bird is on the ground or perched on a branch. Our birds in captivity, usually crowed at intervals of about a minute for 5 to 8 minutes shortly after dawn and again occasionally until about 9 A.M. Calling in the late afternoon was also common though less frequent.

Both sexes often cackle excitedly when frightened, hens seldom cackle after laying an egg.

Interbreeding

No record has been found of the red junglefowl hybridizing with other pheasants such as the kalij or the peafowl. It is well authenticated, however, that the birds occasionally cross with the rather primitive, far ranging village hen in India. In fact such crossing is sometimes encouraged to breed new vigor into those rather scrawny domestic birds. With much larger, more highly domesticated fowls both inclination and opportunity might prove to be rather effective deterrents.

Predation

As is the rule throughout southern Asia, predators of game birds are common in India. Mongoose, jungle cats, certain hawks, and the great-horned owl are not uncommon in junglefowl habitat but so alert is the bird that no evidence of loss from predation was observed. Red junglefowl are frequently encountered in the woods or scrub adjacent to human habitations which is also the roving ground of many semi-domesticated village cats. Egg losses from nests also seem to be of normal proportions. Of 16 wild nests observed in 1960, in only 3 had eggs been destroyed, apparently by a predator.

Reproductive Capacity

It is surprising to find that these progenitors of domestic fowl do not lay as many eggs in the wild as do many species of pheasants. The difference is apparently made up by better brood survival, for, in favorable coverts, the birds are seldom scarce unless they have been seriously overshot the preceeding year. The vital statistics regarding reproduction seem to be as follows:

Breeding age -- Red junglefowl breed the first year following hatching.

Number of eggs -- Normally 5 to 7 with a maximum of 9 or 10.

Brood survival -- Probably excellent.

Life span -- In captivity up to 6 years at least.

Sex ratio -- Unknown. One usually observes more hens than cocks because dominant cocks often collect a harem whereas subordinates often are scattered through the cover.

Renesting -- Will renest if the first nest is destroyed.

Second broods -- Although several authors have indicated that second broods may be produced, no actual case of this has been recorded.

Diseases and Parasites

Almost no study has been made of the diseases and parasites of wild junglefowl. Birds living in the vicinity of villages located near the forest are in fairly frequent contact with probably diseased village hens; yet, where guns and nets are scarce, they seem to maintain themselves in considerable abundance year after year. Those trapped alive and kept with poultry, or in contaminated areas have been known to die of Newcastle disease in India. They probably also are subject to many other diseases common to poultry.

As to parasites, lice were found on one bird shot in the wild. Among the five wild birds on which a post mortem was made no internal parasites were recognized. Given a more representative sample, it is probable that some would have been found.

To avoid, insofar as practical, the possibility of introducing disease along with the 72 red junglefowl breeders shipped to date to the United States from India, 70 of these were raised in New Delhi either from eggs or chicks gathered in the wild. In rearing these, coccidiosis and simple coryza were the only two diseases encountered.

Analysis of Competing Interests

Relation to Agriculture

In considering the advisability of introducing a foreign species of game bird into the United States, no question was more carefully considered than that of the species relation to agricultural pursuits in its native region. Since these birds often feed in cultivated fields adjacent to woodlands many people have assumed that they are primarily granivorous. This may not be true; for, in examining 37 crops of birds, some shot at the edge of cultivation, grain was found in only two. Junglefowl probably will occasionally eat wheat, barley, rice or corn gleaned from the waste in the field. No farmer, of the many contacted, however, considered the junglefowl to be a pest on his crops. In fact, most of them doubted that standing grain was ever disturbed by these birds. The availability of waste grain, wild seeds and insects, and a liking for open places close to cover would seem to be the major reasons why junglefowl are often seen at the edges of cultivation. Likewise, though skillful at perching and certainly partial to a wide variety of wild fruits, no complaint of damage to cultivated fruits was recorded.

The probability of these birds crossing with the rather primitive, wide ranging strains of village hen, common in India has already been mentioned. With larger, more highly-developed birds which seldom range far from home, this is unlikely to occur.

Usefulness

As a source of food -- the flesh of a young red junglefowl resembles that of poultry though older birds are likely to be tough. In primitive areas, these birds are much prized as food but, in modern India, because they are neither easy to shoot nor to trap, many now hunt them for sport. Most of the birds are now to be found in the "reserve forests" where poaching is being increasingly discouraged. Thus very few are sold on the open market as food.

As fighting birds -- wild red junglefowl do not tame easily enough to make good fighting cocks. Game bantams occasionally are crossed with them for increased vigor and through rigid selective breeding dating far back, now have been developed into fighter strains that possibly are superior to the original stock.

As a game bird -- among the forest-inhabiting game birds of India, none are currently as abundant or have maintained their numbers as successfully in the face of every increasing hunting pressure as has the red junglefowl. Other, rarer pheasants stand higher on the list as trophies, but the "jungli moorghi" (literally jungle chicken) is most likely of all to be well represented in the hunters bag. Shy when pursued, agile, fast of wing and adaptable to many different types of cover, it possesses most of the characteristics required to make an ideal woodland game bird.

Junglefowl shooting can be a very sporting proposition, requiring quick decisions, with most shots having to be chanced at surprisingly fast-flying birds. Many will sneak away rather than fly unless surprised, and a good dog is desirable to flush and to follow the birds. They are often reflushed from a tree in which they have effectively concealed themselves. The junglefowl offers better shooting than ring-necks and, in wooded areas are more wary and almost as difficult to hit on the wing as the ruffed grouse.

Competion With Other Game Species

In India the upper range of the red junglefowl often overlaps the lower range of the kalij pheasant. Generally these two

species pay little attention to one another. During the breeding season, however, junglefowl cocks are pugnacious, fighting freely among themselves, sometimes to the death. There is one record of a junglecock killing a male kalij pheasant in combat.

Black or gray francolin are occasionally found in the same covert in the lower part of the range of the red junglefowl. In such situations there is no indication that these species are incompatible.

Breeding and Raising

Junglefowl are rather easy to breed and raise on a game farm. Both adults and young can be handled and fed much as are ring-necked pheasants, though cocks are more pugnacious and should be penned singly with three to four hens at breeding time. Wild-trapped adults and hand-raised youngsters are seldom as tame as ring-necks in captivity and are considerably quicker and more nervous when disturbed. Delacour indicates that birds long in confinement may become fat and sluggish. Adults and young kept in the pens at New Delhi, India, for three to six months remained sleek and wary with a surprising amount of jump and struggle, often resulting in scalped heads when confined in shipping boxes unless the top was covered with stout burlap. Of 107 hatched from wild eggs or picked up as day-old chicks, only five birds were lost in rearing up to 10 and 12 weeks of age.

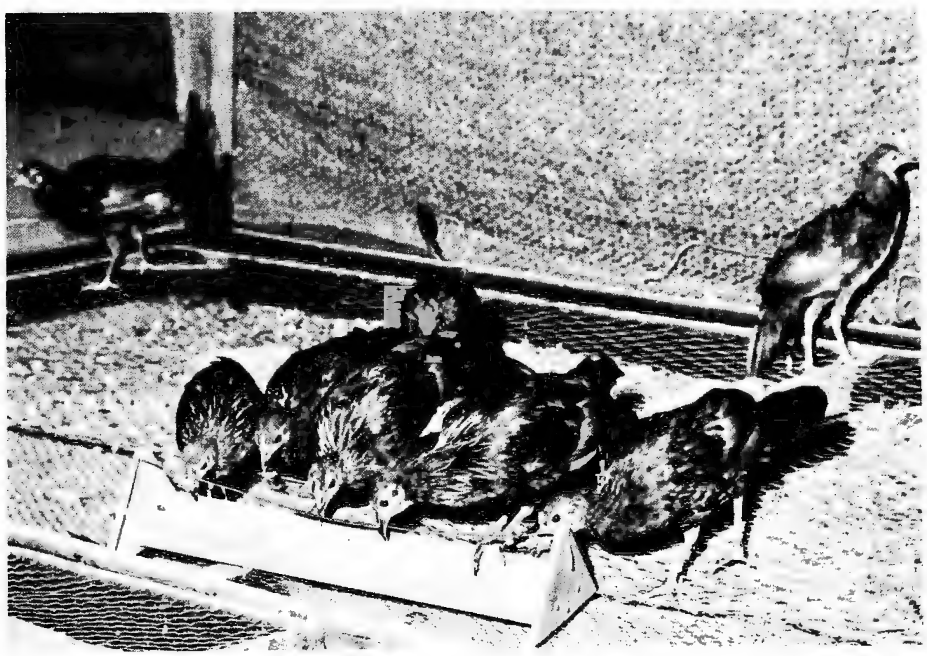

Figure 8 -- Three months old red junglefowl raised in pens in New Delhi, India, from wild-gathered eggs.

THE KALIJ PHEASANTS

Red junglefowl and kalij pheasants are presented in the same report for several reasons. Both are woodland birds whose range extends along the southern flanks of the Himalayas. From 2,000 to 5,000 feet, in many places, they occupy much the same type of forest cover. From this belt upwards to 11,000 feet is kalij country; at the lower elevations one finds mostly junglefowl. Taxonomically they are also closely related. Both can easily be raised in captivity.

The kalij pheasant, however, is more of a woodland bird, frequenting both edge and the deeper forest. Seldom is it encountered in cultivated fields or heavily pastured woods. The black-breasted kalij, for the most part, inhabits lowland valleys and adjacent uplands. Other Indian subspecies prefer mountain slopes, hillsides or roughly eroded areas, often deeply cut by wooded ravines, though in winter they are often found close by on wooded or bushy flatlands.

Delacour (6) classifies the kalij pheasants in the genus Lophura in which he also places the silver pheasants, blue pheasants, firebacks, and wattled pheasants. Peters (9) following Stuart Baker (3) puts the kalij and part of the silver pheasants in the genus Gennaeus. Nor is there close agreement as regards species and subspecies. Delacour (6), whose classification is followed here, recognizes one species Lophura leucomelana with nine subspecies. These extend in range from the Indus in northern West Pakistan eastward along the foothills and lower Himalayas and south to southern Burma and western Thailand. Only four of these subspecies are abundant and widespread in northern India and are therefore considered here.

Except for the junglefowl, no pheasant in India is as widely distributed or provides as much hunting as do the kalij. It is inclined to be slightly less wary than our common ring-neck but, living in much thicker cover where shooting is more difficult, it seems to withstand fairly heavy hunting pressure rather well.

In general the kalij pheasant is likely to inhabit rougher, more heavily wooded country than the junglefowl. Also kalij normally are exposed to more snow and to colder temperatures.

It would seem that the highlands from West Virginia and Kentucky south, the Ozarks, parts of western Oregon and Washington, and some of the uplands in Hawaii might offer conditions not too different from those found in the range of the white-crested kalij in India. Another subspecies, the black-breasted kalij, might be worth a trial in the forested, less rugged parts of the deep South.

Taxonomy and Distribution

Order	Galliformes
Family	Phasianidae
Genus	Lophura
Species	L. leucomelana

Subspecies

White-crested Kalij	L. l. hamiltonii	The western Himalayas from the Indus River to western Nepal.
Nepal Kalij	L. l. leucomelana	Western, central and southern Nepal and adjacent India.
Black-backed Kalij	L. l. melanota	Eastern Nepal, Sikkim, western Bhutan and adjacent India.
Black-breasted Kalij	L. l. lathami	Western Bhutan, Assam, hills of East Pakistan and western Burma.
Black Kalij	L. l. moffitti	Unknown
Williams Kalij	L. l. williamsi	Western Burma
Oate's Kalij	L. l. oatesi	Hill country of southwestern Burma.
Lineated Kalij	L. l. lineata	Rough country of eastern Burma and northwestern Thailand.
Crawfurd's Kalij	L. l. crawfurdi	Rough country in southeastern Burma and adjacent Thailand.

Introductions

Present records indicate only the black-backed kalij as having been liberated in the United States. In the early 1900's five pairs were released by the Connecticut Game Commission; nothing was heard of them thereafter. Though kalij are easily raised in captivity, they have never been popular because of their generally dark plumage. This may account for the lack of attempts to acclimatize these birds in several parts of the world.

The Kalij Pheasants of India

This report is primarily concerned with the four subspecies of kalij pheasants that are abundant in India, Nepal, Sikkim and Bhutan. These were selected because they are the more northerly races to live under climatic and habitat conditions most nearly comparable to the United States. The white-crested kalij has been covered in greater detail than the others since it, in characteristics, is fairly typical of all and is the one most likely to be available for trial introduction.

Common Names

Local names, as usual, vary considerably. Those most frequently used in India include the following:

Kalij	General
Kaleege	General
Kukra	Hindi, northern India
Murghi Kalij	Hindi, northern India
Kalesur	Hindi, northern India
Kolsa	Punjabi, northeastern India
Rechabo	Nepal, Bhutan
Kar-rhyak	Lepcha, Sikkim, western Bhutan
Mathura	Southwest East Pakistan
Modura	Assam
Derrik, durug	Assam
Deodip	Assam
Inruitip	Naga, northern and eastern Assam
Yit	Burma

Distribution and Relative Abundance

The range of the four subspecies of kalij covered in this report extends for approximately 1,700 miles from the Indus River in northeastern West Pakistan to the Irrawady River in western Burma and south along the mountains of Assam, Manipur, and Tripura into southeastern East Pakistan. The white-crested kalij lives along the southwestern flanks of the Himalayas from 1,200 to 11,000 feet. To the east, in central Nepal is found the Nepal kalij though seldom above 10,000 feet. Still further east, in western Nepal, Sikkim, and Bhutan is found the black-backed kalij. The black-breasted kalij occurs in Eastern Bhutan, Assam, and southward living generally in the plains and hills, commonly at elevations up to 2,500 feet, though specimens have been collected in Bhutan up to 6,000 feet.

For security reasons Foreign Game Introduction Program personnel were permitted access only to the southern fringes of kalij range, mainly in northwestern India. Here the white-crested kalij, often living in close proximity to the red junglefowl, was fairly abundant. Ten beaters in one morning put up about 30 birds in thrashing out some 800 acres of steep hillsides at the head of a small valley west of Simla. Not far away was the "Viceroy's beat" where 50 beaters are said commonly to have flushed 50 to 75 birds over a line of six guns in a morning. The game warden at Dehra Dun estimated about 100 kalij as winter residents in and along about three miles of one steep-

sided valley in the Siwalik foothills. Generally, however, kalij pheasants in the lower area are less concentrated (and probably less numerous) in favorable habitat than are junglefowl.

No reliable records of yearly abundance in any one area were uncovered. No one, familiar with the birds, could recall any evidence that would indicate them to be cyclic, although considerable variation in abundance is recorded from year to year.

Description

Kalij pheasants are generally dark-colored, rather heavy birds. Their tails are moderately long, compressed, and often somewhat sickle-shaped. Large, reddish wattles and bare spots are found about the eyes. Males possess a distinct crest, usually carried horizontally back from the crown; in females the crest is shorter.

The following key will distinguish males of the four subspecies here considered.

1. Crest long, thin, whitish, or pale brown -- white-crested kalij.
2. Crest black and more pronounced.
   a. Breast black, glossed with steel blue and purple -- black-breasted kalij.
   b. Breast brownish gray.
      (1) Lower back and rump black-feathered with white fringes -- Nepal kalij.
      (2) Lower back and rump feathers shiny steel blue with black border - black-backed kalij.

Delacour (6,p.126-127) provides the following description of the white-crested kalij.

"Male

"Long and rather thin crest of disintegrated white or pale grayish brown feathers falling on the nape; head and neck purplish black; mantle glossy bluish black, the feathers with pale gray edges and a white shaft; feathers of middle and lower back, rump, and lesser tail-coverts black with an indistinct narrow subterminal brown line and a broad terminal white fringe 5 mm. wide; tail black, brownish at the tips; primaries and secondaries blackish brown; chin and throat brownish black; breast and sides of body covered with long, lanceolate feathers

dark brownish gray at the base, light gray to whitish at the tip; those of the flanks and abdomen are broader, dark gray with pale edges and a white shaft. There is much variation in the colour of the crest and of the breast feathers. Irish brown to orange; face wattles scarlet, with tiny black featherlets; bill greenish white, more or less tinged with blackish at base and on culmen; legs pale brown to gray.

"Length: 650-730 mm.; wing: 225-250 mm.; tail: 230-350 mm.; culmen: 23-30 mm.; tarsus: 75-80 mm.

"As in all subspecies of leucomelana, young cocks assume the adult plumage in their first year.

"Female

"Long crest dull brown with pale shafts; body plumage pale brown, inconspicuously vermiculated with blackish, each feather with a pale shaft and a light gray border which is missing in the flight feathers; two or four central rectrices brown vermiculated and streaked with black and buff, the others blackish with pale tips; belly paler. There is a good deal of individual variation in the depth and shade of the brown. Soft parts as in the male, but browner.

"Length: 500-600 mm.; wing: 203-215 mm.; tail: 205-215 mm.; culmen: 20-25 mm.; tarsus: 65-70 mm.

Size and Weight

The kalij is longer in appearance and somewhat heavier than the red junglefowl. In length the adult white-crested kalij is normally 31 to 34 inches; in weight the males are 2 lbs. to 2 lbs. 6 oz., females 1 lb. 4 oz. to 2 lbs. 4 oz. Black-breasted kalij may be somewhat larger.

Habitat and Cover Preferences

White-crested kalij pheasants are found from the low foothill ranges up into the rough, mountainous country of the outer and middle Himalayan ranges. They are most common between 3,000 and 7,500 feet, often moving higher in the spring and lower in the winter. Other than for this altitudinal movement, they are nonmigratory.

The coverts occupied by the white-crested kalij are fairly typical of the group. Kalij seem to be more at home in high forest with fair to thick undergowth than are red junglefowl but they also

are abundant in more open woodlands with a ground cover of bracken fern, grass and weeds, providing some thick, escape cover is readily available. They also like hillsides partially covered with scattered patches of trees and brush and are partial to dense thickets along steep ravines, especially if some water is available. Old fields and the edges of cultivated lands are utilized when adjacent to wooded or brushy patches. They do not frequent swampy lands.

The range of the white-crested kalij overlaps that of the red junglefowl in the 1,000 to 5,000 feet elevations where there are thick to fairly open scrub ravines, often with mixed deciduous forests on slopes and flats. In the Siwaliks Range at the base of the Himalayas occur deciduous tree species such as Anogeissus latifolia, Acacia catechu, Buchanania latifolia, Bauhinia variegata and sal (Shorea robusta) to mention the more prominent types. Dense undergrowth at the lower elevations, particularly on hot, dry slopes in limestone areas, includes Rhus parviflora, Woodfordia floribunda, Indigofera pulchella, Ziziphus jujuba and Rubus sp.

Moving up the Himalayas to the medium elevations at 3,000 to 6,000 feet, pine, chiefly Pinus longifolia, is the most prominent tree species present. Pine is found on ridges and southern slopes overlapping the deciduous forests at lower levels and extending into temperate broad-leaved and coniferous forests at higher elevations from about 5,000 feet upwards. The pine canopy is fairly open with a scattered understory of Quercus, Ficus, Rhododendron, Symplocos, Myrica and other broad-leaved trees, mostly evergreen. This type usually is persistently burned over, but, where protected from fire and on moist sites both pine and broad-leaved species grow more profusely.

Thick, shrubby undergrowth in pine areas is found growing mostly near watercourses and consists of Rhus parviflora, Rubus ellipticus, Indigifera pulchella, Glochidion velutinum, Pteris aquilina, Viburnum coriaceum, Leptodermis lanceolata and minor other genera. This again, is the direct result of frequent fires. In burned-over areas a grass cover is usual with the genus Andropogon most prominent. A number of bulbous and annual herbs flower in the monsoon season.

Above the pines, from 5,000 to 9,000 feet, oak forests predominate especially in the outer ranges and more commonly on the southern slopes. Rainfall, here, is sporadic except during the monsoon, and snow seldom lasts long except on the colder, northern slopes. When well-developed, the fairly dense canopy is composed largely of Quercus incana with some other species of oak and Carpinus. In more moist or fertile, situations there occurs an admixture of Celtis, Aesculus, Ulmus, Juglans, Morus and other genera with Quercus incana.

Figure 9 -- Either kalij or junglefowl may be expected in this type of cover.

Figure 10 -- Kalij prefer hilly or mountainous country but also spread out into wooded flatlands with undergrowth and edge cover.

Figure 11 -- Kalij pheasant cover in the outer range of the Himalayas.

The understory, especially on moist sites, includes Rhododendron, Ilex, Betula, Cornus, Castanopsis, Symplocos, Pieris, Euonymous, Pyrus, Prunus and Rubus to name the more characteristic genera.

Undergrowth on the north slope in oak woodlands is fairly dense consisting of many genera common to United States woodland habitats, such as Rubus, Viburnum, Berberis, Indigofera, Lonicera, Desmodium, and Myrsine. Also present in the forest vegetational make-up are the genera Vitis, Rosa, Loranthus, Smilax along with various Lauraceae and several varieties of bracken fern. In the denser forests there is very little grass but a thick grass cover develops whenever the forest is opened up.

Of the same altitudinal range as the oak forests, and replacing them on drier, cooler slopes and ridges with considerable snowfall, are also found not too dense forests of deodar (Cedrus deodara) with some Pinus excelsa. The understory and shrub growth includes most of the species listed for oak forests.

Coniferous forest trees in the highest range of the white-crested kalij are common in favorable moist or northern slope situations between approximately 8,000 and 10,000 feet or more. Dominant species include pine (Pinus excelsa), silver fir (Abies pindrow), spruce (Picea) and Quercus. Among the subdominant trees are Acer, Juglans, Corylus, Celtis, and Ulmus. Shrubby undergrowth is common, and a rich herbaceous vegetation is present particularly during the monsoon season, along with a variety of ferns and grasses.

The Nepal kalij pheasant is most common between 4,000 and 6,000 feet but ranges as low as 2,000 feet and up to 9,000 feet or more. In Nepal where the red junglefowl range ends on the lower foothills, the kalij pheasant range begins, extending upward to the range of the monal and tragopan pheasants. The latter two pheasants usually live at about 8,000 feet.

Habitat conditions and soils are generally the same as for the white-crested kalij. At the higher elevations above 7,000 to 8,000 feet, heavy winter snows and very cold weather cause the pheasants to move downward, whereas summer temperatures result in local upward movements for feeding and nesting purposes.

The black-backed kalij pheasant is found in the eastern Himalayan Mountains, being most numerous between 2,000 and 5,000 feet. Near Darjeeling, a 7,432-foot hill station, this bird occupies subtropical

wet and temperate type forests. Rainfall at this station averages 126 inches a year. This species is also found in ravines with dense thickets adjacent to tea plantations into which it may feed and sometimes nest, if sufficient ground cover is present. At lower elevations ideal habitats contain steep gullies on hill slopes that are densely overgrown and in close proximity to water.

Soils are mainly the same as with the two preceding species but tend to be more acid.

The black-breasted kalij pheasant occupies a wider range than any of the other kalij pheasants. This bird is found commonly along rivers and extends out into the locally rough, forested plains up to 50 miles, as well as in low-lying hill forests. It intermingles with the red junglefowl along the Brahmaputra River in Assam in brushy, wooded edges, with elevations varying from 115 to 348 feet at opposite ends of its river habitat.

This species is most abundant from the plains level up to 3,000 feet, though some birds live in the Himalayas in eastern Bhutan up to 6,000 feet. In the lower, mountainous country, hot, humid valleys adjacent to fairly dense to thick, generally moist forests are much preferred.

Soils at lower elevations are largely recent alluvial formations over old sandstones and shales, whereas in the hill forest areas sandstones and shales, plus crystalline rock outcrops occur. Some soils are highly acid, whereas the new alluvial soils of river banks are less acidic, often neutral or even alkaline. In the Brahmaputra River valley, soils are generally sandy.

Two types of forests are inhabited by the black-breasted kalij, from the plains and river levels up to 3,000 feet. The first is a semi-tropical, wet, evergreen forest, mainly of broad-leaved species. The second is a mixed deciduous-evergreen type occurring in lower rainfall areas, usually less than 90 inches annually.

Wherever rainfall exceeds 90 to 100 inches, a wet, broad-leaved, largely evergreen forest occurs on flat ground of large alluvial plains extending up into the hills. Typical tree species present include sal (Shorea assamica), Dipterocarpus, Artocarpus, and Cinnamomum. Bamboo is often one of the understory species. An undergrowth of broad-leaved, evergreen species is dense in the plains forests but more scattered on hill areas.

Found largely on flat ground and hill country of Assam is a mixed deciduous and evergreen forest dominated by broad-leaved

evergreens, particularly in the lower canopy. This forest type, usually dense and high, is composed of such characteristic trees as Altingia, Maglietia, and Talauma, and of less common or occasional occurrence are Cinnamomum, Atrocarpus, and Mesua. Undergrowth consists of various Lauraceae, Anonaceae and Meliaceae. Several genera of bamboo may occur. Ground cover is usually poor where undergrowth is dense. Where light is adequate, monocotyledonous herbs and members of Rubiaceae are abundant. In the semi-evergreen forests, sandy loam soils are common.

The black-breasted kalij is fond of feeding on long, flat spurs or knolls covered with broad-leaved evergreens or deciduous trees but retires into ravines or brushy areas for escape and resting. A small stream along the ravine bottom is preferred. Precipitous cliffs are also inhabited as well as small clearings and roads if surrounded by dense entanglements.

Climatic Comparisons

Weather data are scarce and seldom complete from much of the kalij range in India. For this reason, it has not been possible to establish climacurvic comparisons of use in locating similar climatic zones in the United States. In place of this, presented in Fig. 2, is a map indicating areas which by climate and topography would appear to be suitable for trial introductions.

From this it will be noted that the white-crested kalij, the Nepal kalij and the black-backed kalij would appear to be adaptable to the central and southern Appalachians and adjacent hill country through Kentucky and Tennessee, to the Ozarks and to parts of the Northwest. Presumably, in summer, its range might extend up into that of the ruffed grouse along the central Appalachians and to be lower down in winter. In general, however, kalij pheasants might be expected to thrive in a climatic niche which is too warm for grouse to be found in abundance.

The black-breasted kalij of Assam might occupy still warmer woodlands in the rougher parts of the deep South and possibly spread out into many forested areas where the topography is comparatively flat.

The white-crested, the Nepal, and the black-backed kalij are found where summers are mild to hot and humid, with winters mainly mild to cool. To the species' advantage, a downward migration occurs, when very cold weather or heavy snows affect the higher elevations. Movement may be down to 1,500 feet or even lower into the lowest foothills and adjacent flat lands, depending upon the severity of the weather.

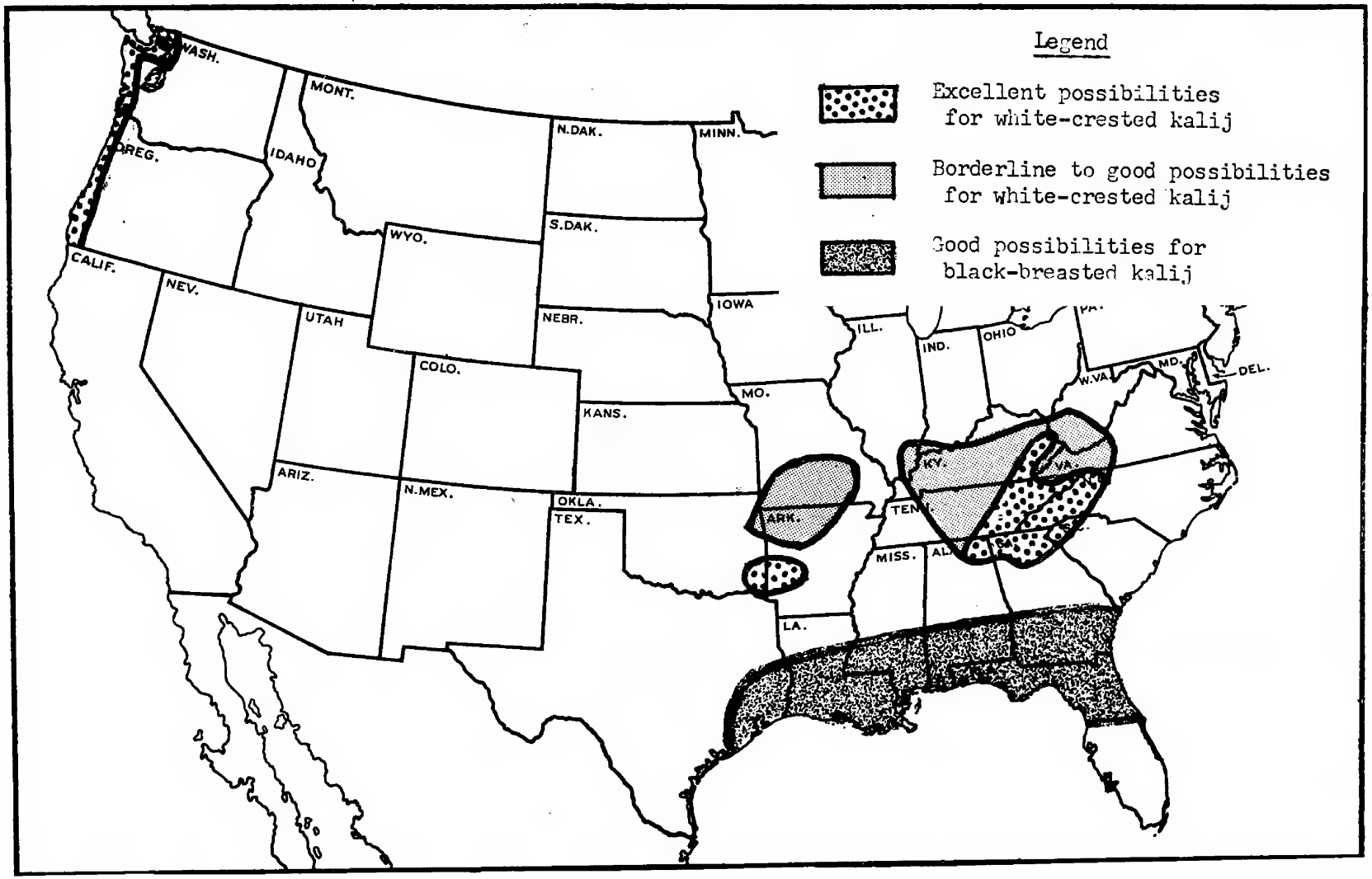

Figure 12 -- Areas in the United States which by climate and topography are similar to kalij pheasant range in India.

Temperatures in the range of the species for winter (December through February) and for summer (June through August) are listed below.

Elevation	Winter		Summer	
	Avg. max	Avg. min.	Avg. max	Avg. m
Lower elevations (Approximately 1,200 to 3,000 ft.)	68°F	45°F	88°F	74°F
Middle elevations (Approximately 3,000 to 6,000 ft.)	49	34	84	65
Higher elevations (Approximately 6,000 to 9,000 ft.)	44	28	69	58

Snow is reputed to be quite deep at the upper elevations, so the bulk of the winter kalij populations will be found below 9,000 feet. Snow falls in most years down to 5,000 feet but melts rapidly except in sheltered northern slopes or at the higher elevations. Sharp frosts are usual in winter even in the lower valleys, which are commonly full of mist in the mornings during January and February.

Precipitation occurs mainly from June to October, increasing in amount from northwestern India eastward to Assam and Burma. Almost every month shows some moisture falling in their range, usually averaging 0.50 inches or more each month. In the extreme western portion, the annual rainfall extends from about 27 inches at the higher elevations to 35 to 40 inches at the lowest levels. Eastward through northern India and Nepal, rainfall generally ranges between 50 and 90 inches annually to as high as 126 inches for Darjeeling. When cool and rainy weather is found at the higher elevations, the birds may be found in open areas throughout the day.

In the black-breasted kalij range, little up and down movement occurs due to mild weather conditions which prevail the year round. In spring or early summer a movement to higher elevations occurs in some populations. Winter and summer temperatures average fifteen to twenty degrees higher with little to no snow and much more rainfall occurring than in the range of the other three species. The rainfall in Assam averages between 64 inches and 129 inches from May to September. Throughout the remainder of the year rainfall averages two inches or more each month, illustrating the wet climate to be found over much of its range. In Bhutan, however, where these birds are also resident up to 6,000 feet, precipitation is substantially less.

Food and Water

Kalij pheasants, as a whole, are omnivorous, taking many seeds, berries, tender grass, herbs or shrubs, roots (but not buds) and a variety of insects, worms and larvae. They will feed around edges of village fields only if sufficient heavy forest or brush thickets are nearby. They eat some waste grain, principally corn or wheat, but present records do not indicate any significant damage done to cultivated crops.

They feed in early morning and evening in forest clearings, along forest roads and trails, edges of cultivation, and along the open banks of rivers and streams. An area with a stream, river, or spring is preferred, not only by the adults, but also for use by the broods. Birds often travel several miles to water late in the afternoon before going to roost.

General Habits

Movements and Mobility

Like the junglefowl, kalij are nonmigratory but are not as closely wedded to a restricted home range. They are more likely to be scattered throughout favorable coverts and to walk and fly fair distances from one covert to another or through forest and brushy areas.

With or before the advent of snow in the higher parts of their range the white-crested kalij moves often some distance down into the lower foothills and adjacent valleys. The black-breasted kalij, occupying much lower and often less rugged terrain may wander further and into the forested flatlands often establishing a winter range in the wooded and brushy borders of streams or about native villages. By March the white-crested kalij usually is working its way upwards again, though generally leaving a scattering of year-round residents behind.

Daily movement patterns have not been well worked out. Shortly after dawn and again after 4 P.M. birds are likely to be seen or heard in the vicinity of roads or trails, or feeding in overgrown fields. A little later, where not overhunted, the birds may travel, usually on foot, in loose groups of 2 to 10, feeding and moving about in the direction of water to which they come with considerable regularity Their thirst satisfied, they work gradually uphill fanning out for feeding then resting through the heat of the day, usually on the ground.

Kalij are not as great scratchers as junglefowl but dig forcefully with their strong bills for roots, bulbs, and corns. Likewise they are great walkers, usually moving rather slowly unless surprised or nervous. Then they run with ease through thick brush or take to wing. They are past masters at concealing themselves among leafy tree branches where they often sit immobile until they have spotted the danger or become frightened. Then a quick swoop downwards between tree crown and undergrowth away from the point of alarm carries them out of danger.

Flight

The flight of kalij is as direct and swift as a ringneck. They launch steeply into the air, flap their wings forcefully until momentum is gained, then sail with occasional wing beats, usually downhill or parallel with the slope. In forested areas, they fly through brush and among trees with an agility surprising for such a large bird. In crossing from one slope to another they are not adverse to taking a direct course, often coming to roost in a tree. Their flight is almost noiseless, once they are launched, and seldom over 300 to 600 feet at a time.

Wariness

Except where heavily hunted, kalij are unwary birds. They are often seen feeding, going to or returning from water along trails, roads, or in overgrown fields. They take fright less quickly than junglefowl but become wary enough to satisfy any sportsman where hunting pressure is substantial.

Resting and Roosting

These birds normally rest on the ground but roost at night in fair-sized hardwoods or conifers, usually at heights of 20 to 40 feet off the ground. The same tree is likely to be chosen by one or more birds for months at a time unless they are disturbed.

Nesting and Renesting

Kalij nests are usually located in or along the edges of woodlands in clumps of thick brush, open below to provide easy escape, by a log, rock or, less commonly, a tree. Open forest with bracken ferns beneath and brushy ravines are other favored locations. Often they are situated on a fairly steep slope and usually not far from water. The nest pictured in Fig. 2 was on a small bench overlooking a pool in a partially dry steam bed. The situation was rather open and the nest was imperfectly concealed by a few forest weeds and flowers.

Figure 13 -- Kalij are a favorite among the sportsmen who hunt the hill country.

Figure 14 -- Kalij nests are found in dense to fairly open cover.

The nest itself is usually a shallow hollow very casually lined with grass, twigs or other forest debris. The normal clutch varies, in our experience, from 6 to 9 eggs, though clutches of up to 14 have been reported.

Nesting dates vary, depending upon elevation, from March to June, according to several authors. Hume (8) found a nest on April 4 at 2,000 feet in the Sawiliks. In our experience this would seem to be early for we did not find a nest with eggs before mid-May in the same area, nor were the females usually with broods before June 5 to 15. This is a full 2 to 3 weeks later than the red junglefowl were observed with broods in the same area.

Like the ruffed grouse the Kalij is so close a sitter that a bird may occasionally be caught on the nest by hand. The generally brown color of the female blends well with the forest floor.

Renesting is the rule when the first clutch is destroyed before hatching.

Eggs

The eggs are rather short and pointed at one end, glossy, creamy white to deep buff in color and spotless except for small white pits in the shell. For the white-crested kalij Baker (3) gives the normal measurements as 49.5 X 36.0 mm., or slightly larger than is the average egg of a red junglefowl. Delacour indicates the period of incubation to be 24 to 25 days.

Brooding and Rearing

Mother and young leave the nest as soon as the chicks are dry. For the first few weeks at least thereafter they are likely to be found in the brush along stream courses or in overgrown fields, though seldom far from water. It is not unusual to see both parents with the young until well into the fall, the whole making a fairly compact group.

The young fly early and by the 4th to 5th week they may be found roosting close together in tall brush or low trees.

Gregariousness

Adult kalij are probably less gregarious than are red junglefowl for one is likely to encounter single birds well scattered through a woodland. Nevertheless small parties of 5 to 10 birds are not uncommon about water holes or in edge cover. Many birds will be seen feeding or traveling in pairs though Beebe (4) observed groups of 4, 8, 4 and 16 birds feeding together on 4 consecutive days.

Psychology and Behavior

The kalij is a somewhat less agile, tamer bird than is the junglefowl. Even wild-caught young, reared in captivity become so tame that they may be easily picked up by hand. Wild adults in pens, however, when closely approached, usually utter a sharp squealing whistle and take to flight.

Males are pugnacious during the breeding season, often fighting among themselves, though seldom to the death. Combats between them and red junglefowl males at such time have been reported with victory usually going to the latter.

In captivity there is normally little difficulty in keeping birds of both sexes closely penned throughout the year. Apparently the females are also sometimes pugnacious, for in the pens at New Delhi several males were killed by females who seemed to take a dislike to particular birds much as do the ruffed grouse. They are not as territory conscious as junglefowl and get along well when penned with most other game birds.

Calls

When excited or alarmed either sex may utter a long squealing whistle often followed by loud and deep clucking noises. There is also a low "tweet" in a conversational tone when the birds are not alarmed. Hens are said to come forth with a deep, repeated "whoof."

Interbreeding

Hume (8) reports that instances are known of the kalij crossing with monal and koklass pheasants though this is certainly rare. There is no record of crosses between kalij and junglefowl even though they are often common to the same forest area.

Predation

Kalij, like junglefowl do not seem to be particularly susceptible to the numerous predators inhabiting southern Asia. Though they are tamer birds, their larger size and weight may be an advantage in this respect. No kalij were found dead from predation nor were any such instances reported to us.

Reproductive Capacity

The reproductive capacity of kalij pheasants while lower than the ringneck is slightly higher than that of the red junglefowl as will be seen from the following analysis.

Breeding age -- Kalij breed the first year following hatching.

Number of eggs -- Normally 6 to 9 with a maximum of 14 for the white-crested kalij; the black-breasted kalij lays slightly fewer eggs.

Brood survival -- Probably good.

Life span -- In captivity up to 8 years.

Sex ratio -- Unknown.

Renesting -- Will renest if the first clutch is destroyed before hatching.

Second broods -- Probably rare. Hume (8), referring to the black-breasted kalij, assumes that some of these birds must have two broods a year since he has found eggs in every month of the year from February to October.

Diseases and Parasites

Little is known of diseases and parasites among wild kalij nor was there much chance in the current program for study. All birds sent to the United States to date under the program were hand-reared, either from wild eggs or very young chicks. As with all other pheasants captured alive in India, trappers and game dealers frequently report losses from disease usually acquired through contact with domestic fowls. Of these, only Newcastle disease has been positively identified though it is almost certain that Kalij in captivity are also subject to many ailments common to poultry.

Analysis of Competing Interests

Relation to Agriculture

Damage to agricultural or forest crops from kalij is practicaly unknown. They seldom spend much time in cultivated fields, seldom

consume much grain, and then only waste, and are not budders or fruit eaters of note. Furthermore they seldom gather in flocks large enough to make a sizeable impact on even their favorite foods. No farmer or forester contacted had a word of complaint against this pheasant.

Usefulness

As a source of food -- The flesh of this pheasant is white, tender and toothsome except for the normally tough old cock. More and better meat is to be found on a kalij than on most junglefowls since the birds are larger and less active.

Because kalij are more difficult to trap and do not congregate in numbers as do the junglefowl few birds have ever been sold in Indian game markets although they are highly-prized for food.

As fighting birds -- Though pugnacious, kalij seem never to have been trained for fighting for they tire more easily and are slower in action than are the favored junglefowls.

As a game bird -- Second only to the junglefowl, the kalij provides more shooting and sport than any other pheasant in India. Commonly, though by no means always, found on rough, often steep terrain, its pursuit with a gun is no sport for the physically weak. Yet for the alert, energetic hunter the kalij offers a trophy that attracts the skilled and the novice alike.

Basically, kalij pheasants probably can not withstand as heavy hunting pressure as can the junglefowl, but there are fewer sportsmen willing to course the deeper woods and rougher country where it is thoroughly at home. Potentially adaptable to the warmer, rough lands and hills of the southern United States, where the ruffed grouse does not thrive, its possibilities as a woodland game bird should not be overlooked.

Competition with Other Game Species

The range of the kalij overlaps to some extent that of the junglefowl and of other pheasants such as the koklass, cheer and monal. Generally these species seem to pay little attention to one another, though at breeding time there may be some aggressiveness among male birds. Penned together with other Indian game birds, the kalij has not caused trouble.

On the wing, kalij, while fast, are generally easier to shoot than is the eastern ruffed grouse. There is a tendency for

them to run uphill and hurtle down. They seldom fly high and are adept at bursting through brush and trees, thus offering considerable tricky shooting. Like the junglefowl and the ringneck they are often inclined to run rather than to flush, unless surprised. Where not heavily hunted, they appear to be as wary as the junglefowl but easier to kill over a dog, which often distracts their attention from the approaching hunter. Most sportsmen in India consider them excellent for the table.

Breeding and Raising

Most of the kalij breed and can be raised fairly easily in captivity. Wild-trapped birds normally breed the second year in captivity though often remaining shy. Game-farm-raised birds and those caught as young chicks tame readily. Touchard (14) indicates that they are less wild in captivity than are ringnecks and less pugnacious than are silver pheasants. He obtained twenty-two eggs and raised sixteen youngsters from one pair of hand-raised birds the year after they were hatched. Older females are said to lay twenty-five to thirty eggs a year, most of which should be fertile. The period of incubation is reported to be 24 to 25 days and the eggs are not difficult to incubate. Fifteen youngsters, hatched from wild eggs collected in India in 1961 were reared without loss or difficulty under less than modern brooding conditions and on a poultry ration which, while the only one available, would not normally be considered satisfactory for game birds.

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